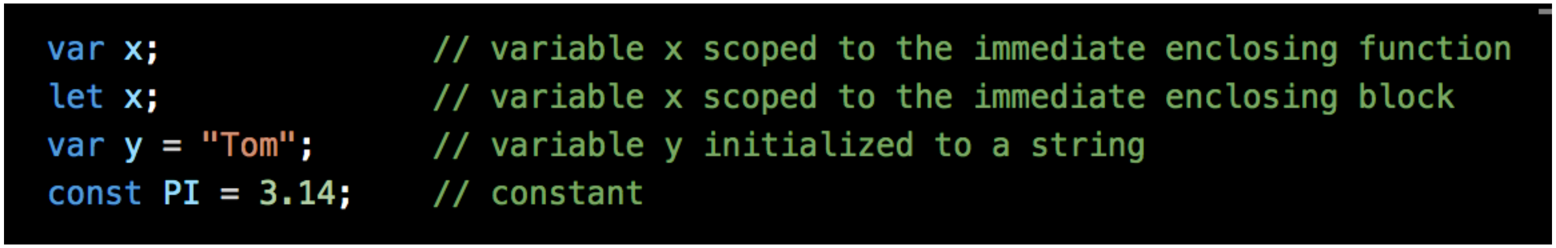
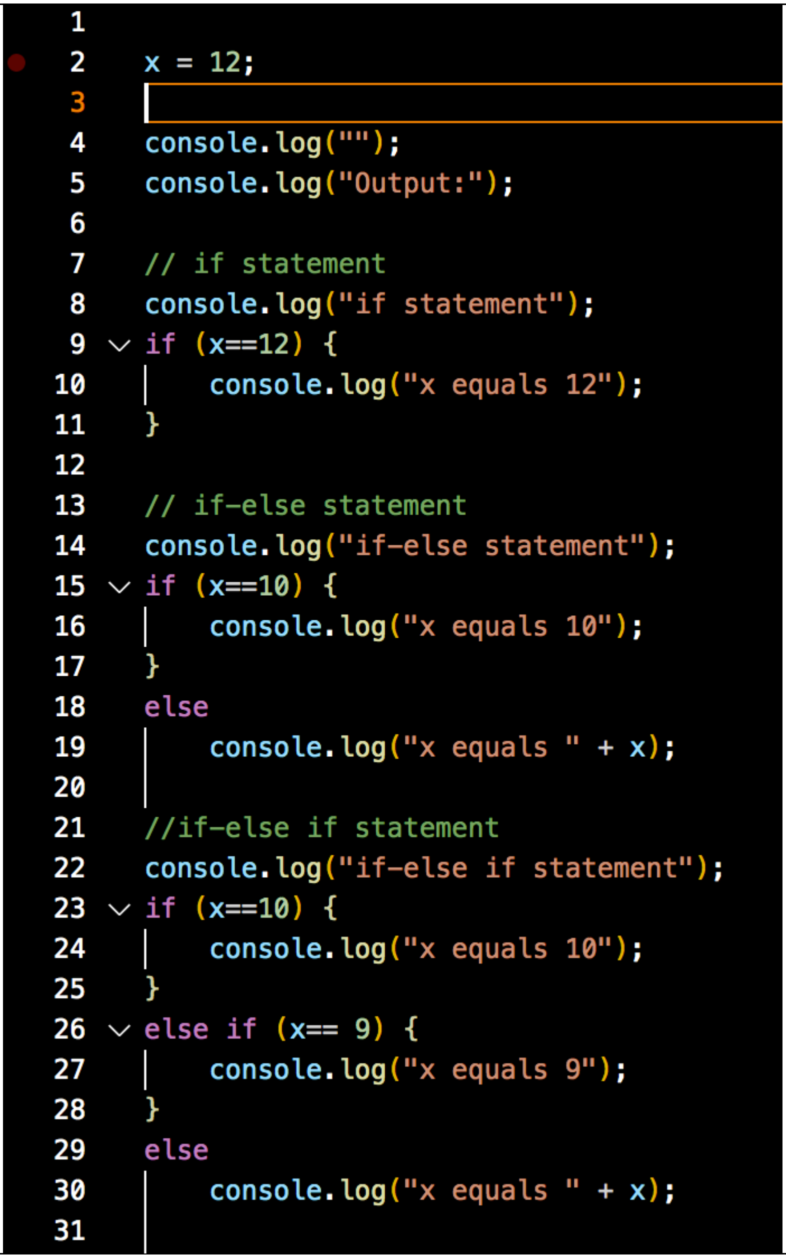
Language Map for JavaScript

Variable Declaration
Is this language strongly typed or dynamically typed? Provide at least three examples (with different data types or keywords) of how variables are declared in this language.
	JavaScript is considered a weakly typed or untyped language. It is dynamically typed in that the interpreter assigns variables a type at runtime based on the variable's value at the time.
	
	Examples of variable declaration:
	
	`var x;                 // variable x scoped to the immediate enclosing function`
	`let x;                 // variable x scoped to the immediate enclosing block`
	`var y = "Tom";         // variable y initialized to a string`
	`const PI = 3.14;       // constant`

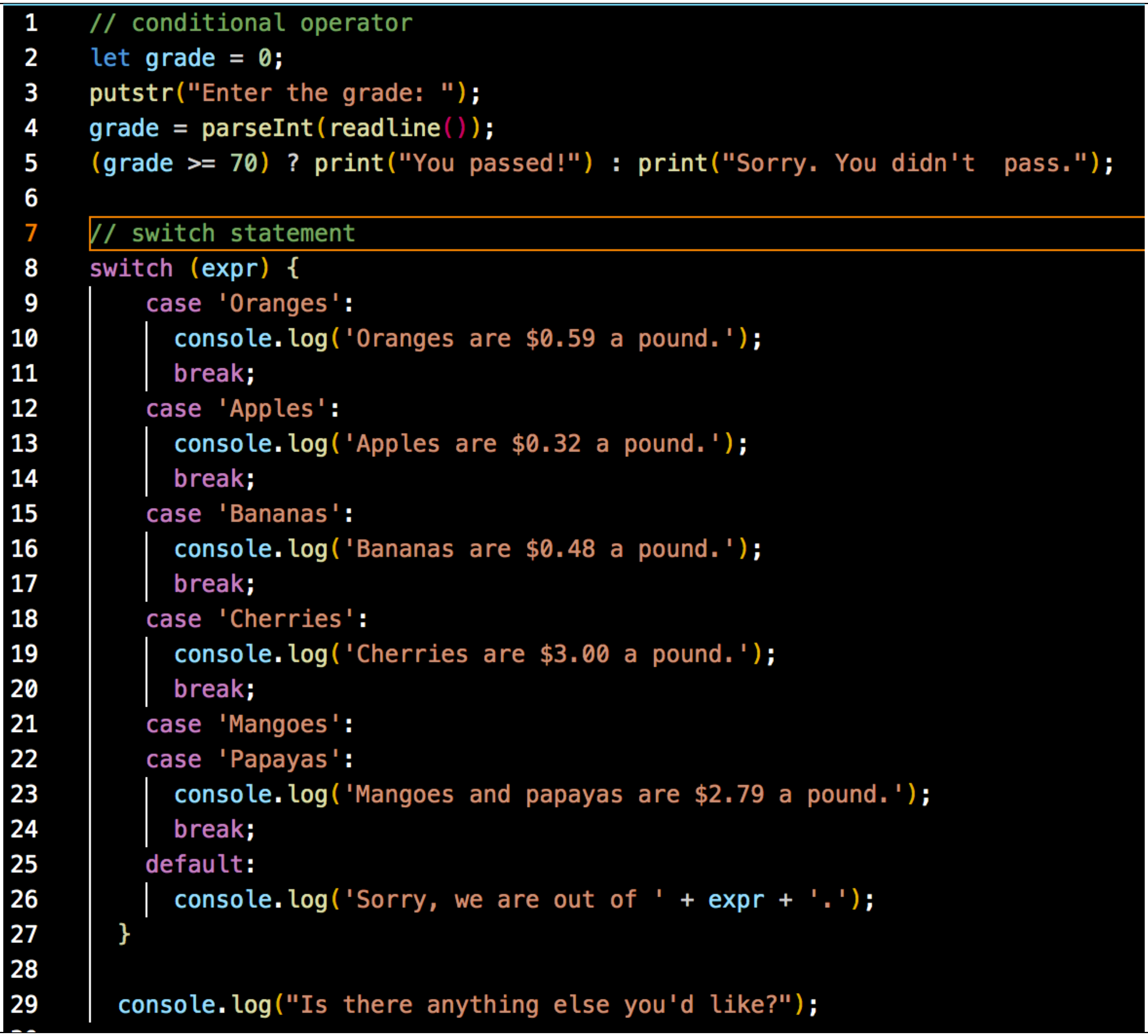
Data Types *List all of the data types (and ranges) supported by this language.*	Data types in JavaScript consist of primitive values and objects. Primitive values: all types except objects define immutable values (that is, values which can't be changed). For example (and unlike in C), Strings are immutable. We refer to values of these types as "primitive values". 1. Boolean type: Boolean represents a logical entity and can have two values, true and false. 2. Null type: the Null type can have exactly one value: null which means nonexistent or invalid. 3. Undefined type: a variable that has not been assigned a value has the value undefined. 4. The Number type is a double-precision 64-bit binary format IEEE 754 value. It is capable of storing floating-point numbers between 2^{-1024} and 2^{1024}, but can only safely store integers in the range $-(2^{53}-1)$ to $(2^{53}-1)$. 5. The BigInt type is a numeric primitive that can represent integers with arbitrary precision. With BigInts, you can safely store and operate on large integers even beyond the safe integer limit for Numbers. 6. String type: JavaScript's String type is used to represent textual data. It is a set of "elements" of 16-bit unsigned integer values. Each element in the String occupies a position in the String. The first element is at index 0, the next at index 1, and so on. The length of a String is the number of elements in it. 7. Symbol type: A Symbol is a unique and immutable primitive value and may be used as the key of an Object property. A symbol value is created by invoking the function Symbol, which dynamically produces an anonymous, unique value. A symbol may be used as an object property. Objects: In JavaScript, objects can be seen as a collection of properties. With the object literal syntax, a limited set of properties are initialized; then properties can be added and removed. Property values can be values of any type, including other objects, which enables building complex data structures. Properties are identified using key values. A key value is either a String value or a Symbol value. https://developer.mozilla.org/en-US/docs/Web/JavaScript/Data_structures

Selection Structures

Provide examples of all selection structures supported by this language (if, if else, etc.) ***Don't just list them, show code samples of how each would look in a real program.***

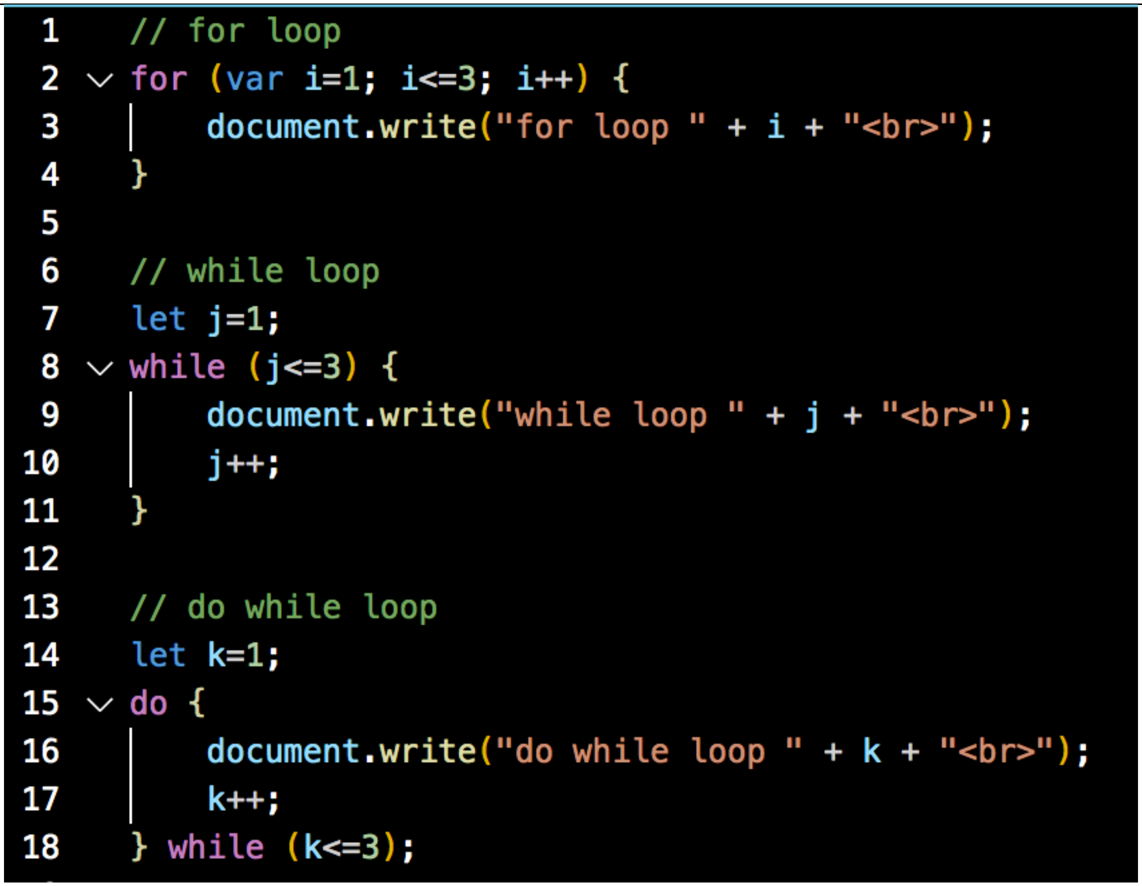


```
x = 12;

console.log("");
console.log("Output:");

// if statement
console.log("if statement");
if (x==12) {
    console.log("x equals 12");
}

// if-else statement
console.log("if-else statement");
if (x==10) {
    console.log("x equals 10");
}
else
    console.log("x equals " + x);

//if-else if statement
console.log("if-else if statement");
if (x==10) {
    console.log("x equals 10");
}
else if (x== 9) {
    console.log("x equals 9");
}
else
    console.log("x equals " + x);

```

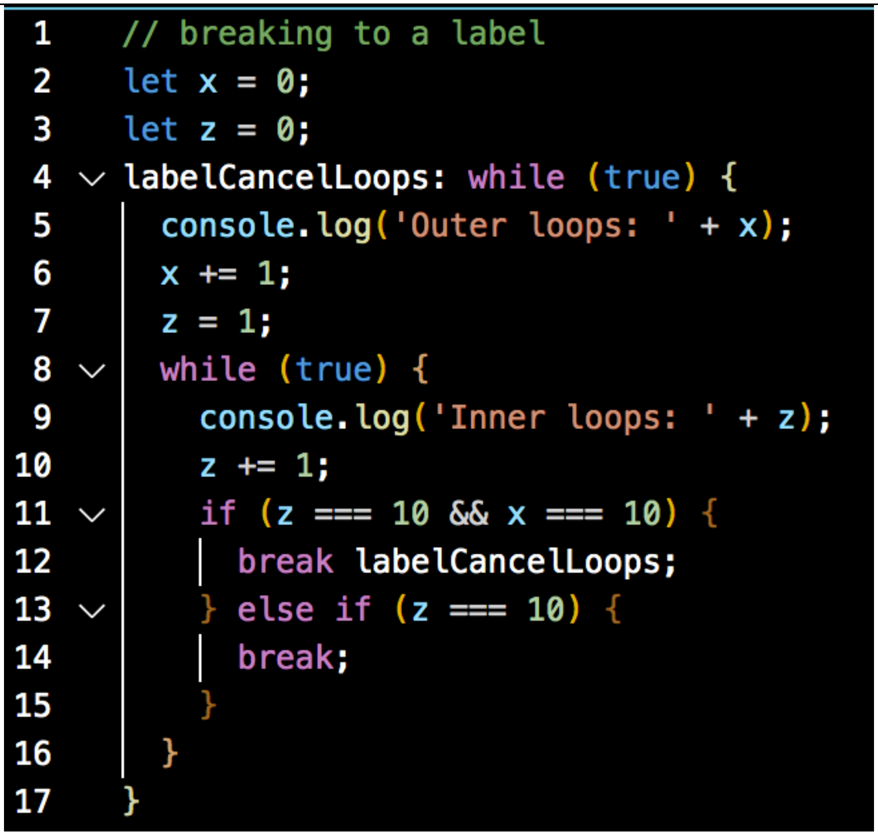


```
// conditional operator
let grade = 0;
putstr("Enter the grade: ");
grade = parseInt(readline());
(grade >= 70) ? print("You passed!") : print("Sorry. You didn't  pass.");

// switch statement
switch (expr) {
    case 'Oranges':
      console.log('Oranges are $0.59 a pound.');
      break;
    case 'Apples':
      console.log('Apples are $0.32 a pound.');
      break;
    case 'Bananas':
      console.log('Bananas are $0.48 a pound.');
      break;
    case 'Cherries':
      console.log('Cherries are $3.00 a pound.');
      break;
    case 'Mangoes':
    case 'Papayas':
      console.log('Mangoes and papayas are $2.79 a pound.');
      break;
    default:
      console.log('Sorry, we are out of ' + expr + '.');
  }

  console.log("Is there anything else you'd like?");
```

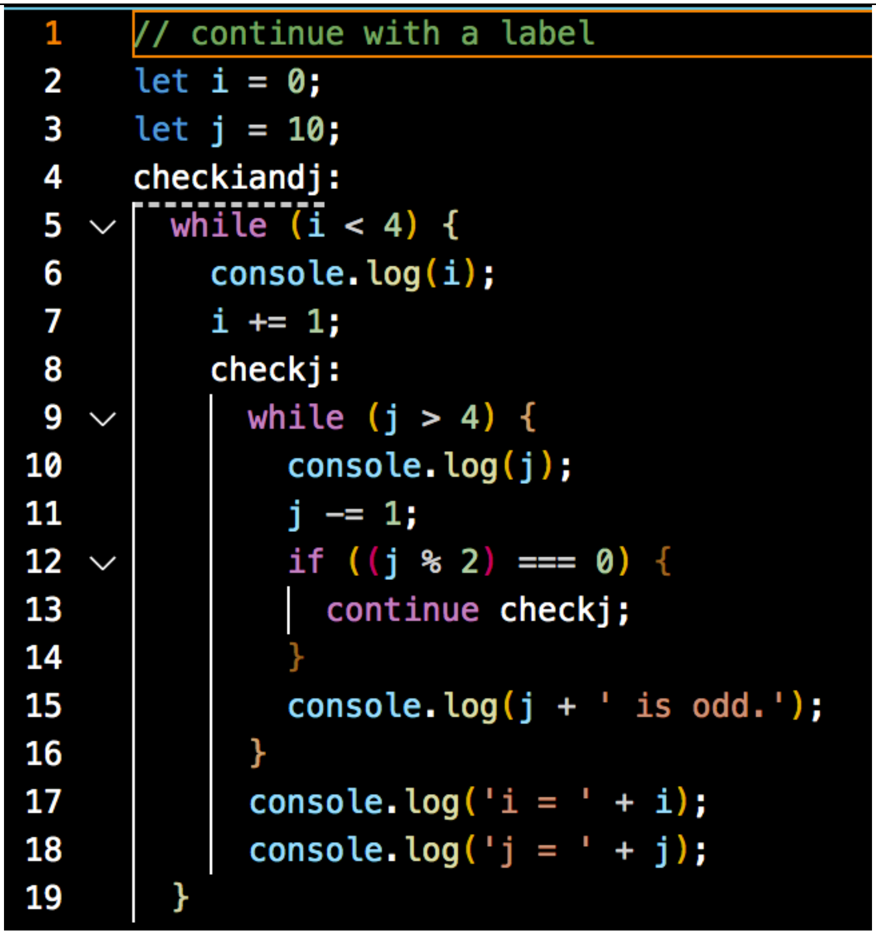
Repetition Structures
Provide examples of all repetition structures supported by this language (loops, etc.) ***Don't just list them, show code samples of how each would look in a real program.***



```
// for loop
for (var i=1; i<=3; i++) {
    document.write("for loop " + i + "<br>");
}

// while loop
let j=1;
while (j<=3) {
    document.write("while loop " + j + "<br>");
    j++;
}

// do while loop
let k=1;
do {
    document.write("do while loop " + k + "<br>");
    k++;
} while (k<=3);
```



```
// breaking to a label
let x = 0;
let z = 0;
labelCancelLoops: while (true) {
  console.log('Outer loops: ' + x);
  x += 1;
  z = 1;
  while (true) {
    console.log('Inner loops: ' + z);
    z += 1;
    if (z === 10 && x === 10) {
      break labelCancelLoops;
    } else if (z === 10) {
      break;
    }
  }
}
```



```
// continue with a label
let i = 0;
let j = 10;
checkiandj:
  while (i < 4) {
    console.log(i);
    i += 1;
    checkj:
      while (j > 4) {
        console.log(j);
        j -= 1;
        if ((j % 2) === 0) {
          continue checkj;
        }
        console.log(j + ' is odd.');
      }
      console.log('i = ' + i);
      console.log('j = ' + j);
  }
```

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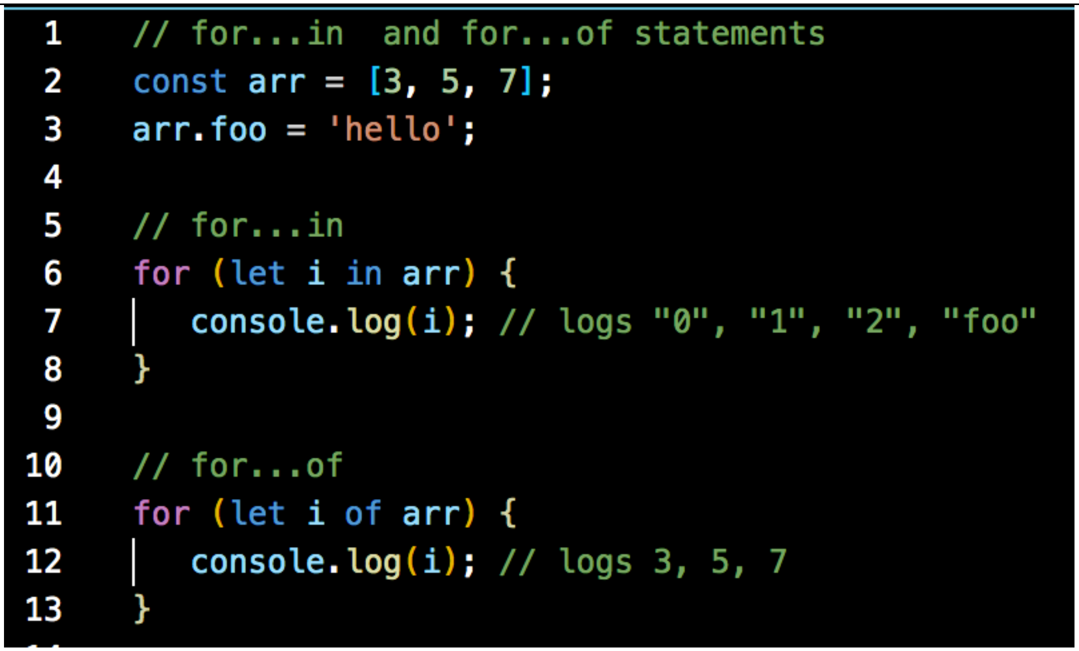

```javascript
// for...in  and for...of statements
const arr = [3, 5, 7];
arr.foo = 'hello';

// for...in
for (let i in arr) {
   console.log(i); // logs "0", "1", "2", "foo"
}

// for...of
for (let i of arr) {
   console.log(i); // logs 3, 5, 7
}
```

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Guide/Loops_and_iteration

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Arrays
If this language supports arrays, provide at least two examples of creating an array with a primitive or String data types (e.g. float, int, String, etc.)

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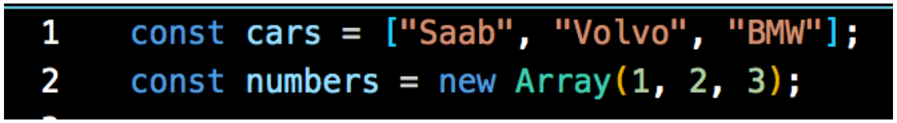

```javascript
const cars = ["Saab", "Volvo", "BMW"];
const numbers = new Array(1, 2, 3);
```

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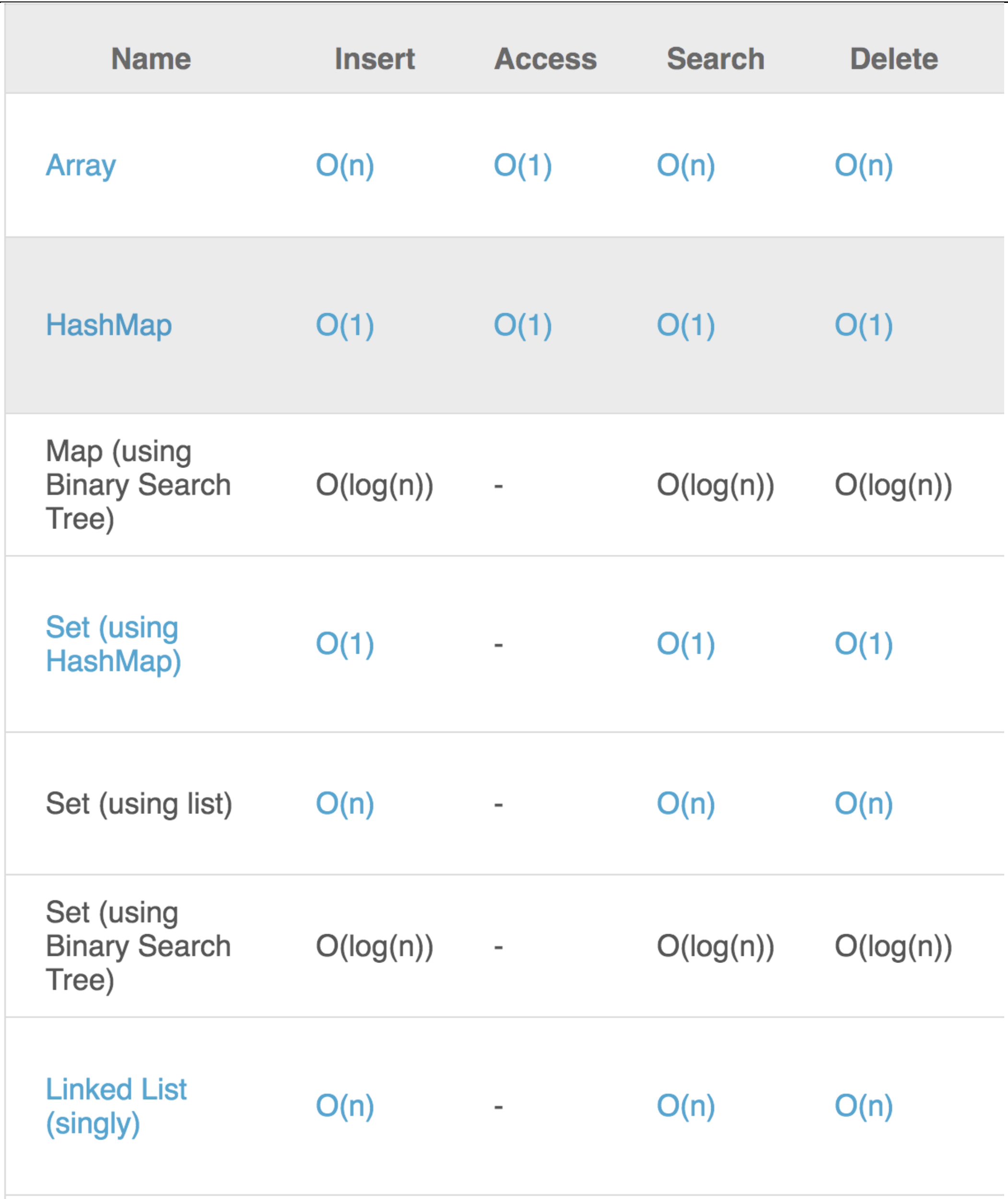
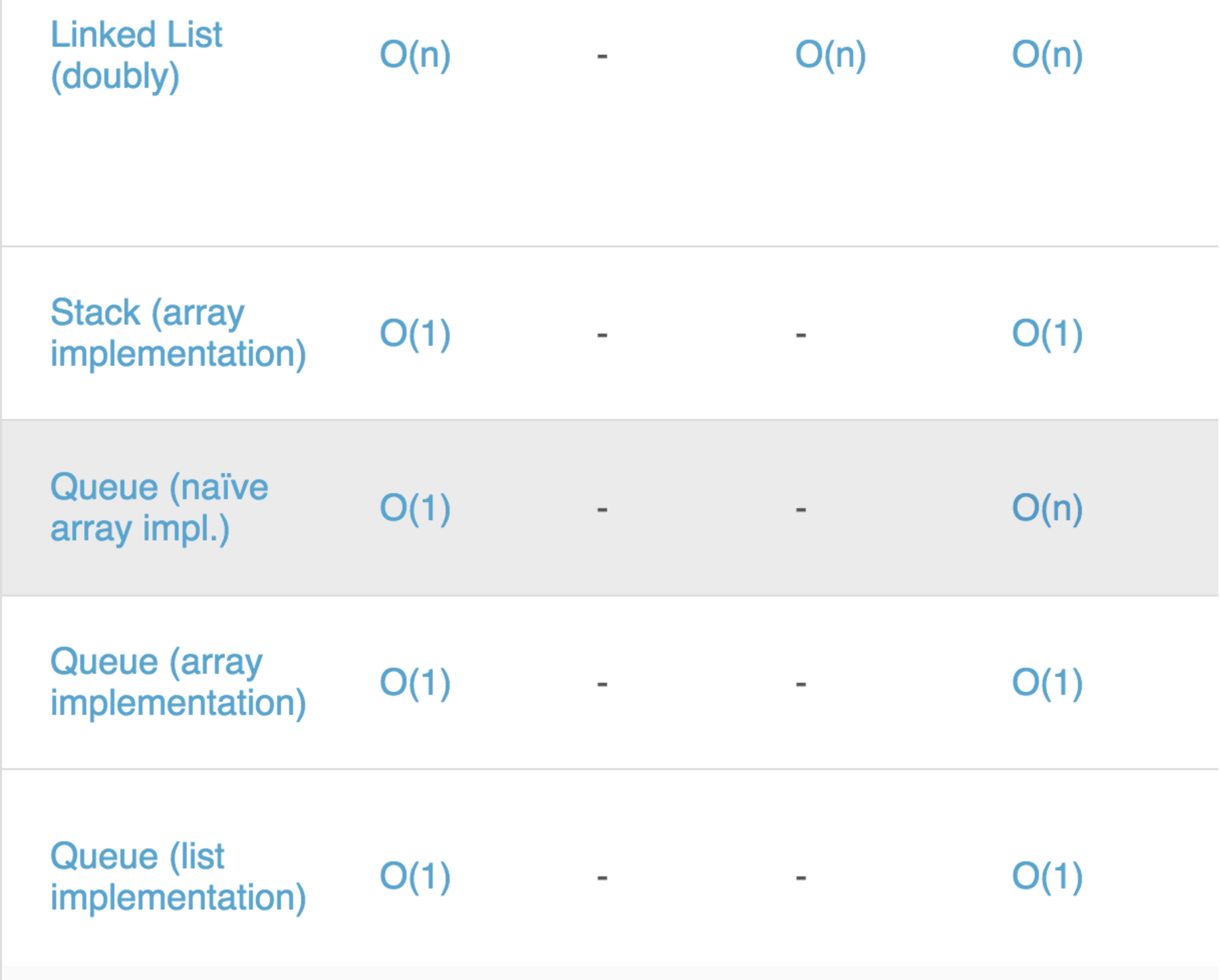
Data Structures

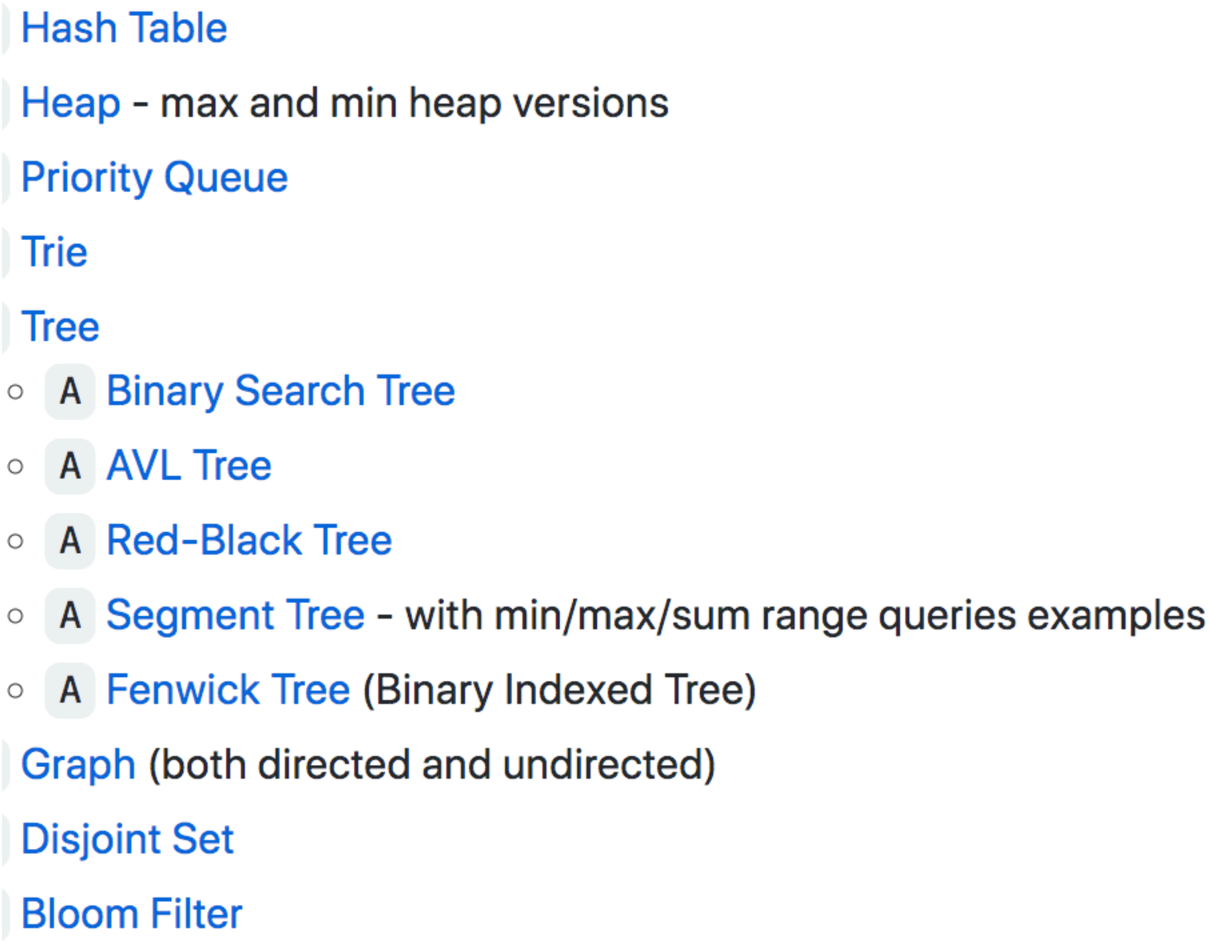
If this language provides a standard set of data structures, provide a list of the data structures and their Big-Oh complexity.



Name	Insert	Access	Search	Delete
Array	O(n)	O(1)	O(n)	O(n)
HashMap	O(1)	O(1)	O(1)	O(1)
Map (using Binary Search Tree)	O(log(n))	-	O(log(n))	O(log(n))
Set (using HashMap)	O(1)	-	O(1)	O(1)
Set (using list)	O(n)	-	O(n)	O(n)
Set (using Binary Search Tree)	O(log(n))	-	O(log(n))	O(log(n))
Linked List (singly)	O(n)	-	O(n)	O(n)



Linked List (doubly)	O(n)	-	O(n)	O(n)
Stack (array implementation)	O(1)	-	-	O(1)
Queue (naïve array impl.)	O(1)	-	-	O(n)
Queue (array implementation)	O(1)	-	-	O(1)
Queue (list implementation)	O(1)	-	-	O(1)

	https://adrianmejia.com/data-structures-time-complexity-for-beginners-arrays-hashmaps-linked-lists-stacks-queues-tutorial/  Hash Table Heap - max and min heap versions Priority Queue Trie Tree ○ A Binary Search Tree ○ A AVL Tree ○ A Red-Black Tree ○ A Segment Tree - with min/max/sum range queries examples ○ A Fenwick Tree (Binary Indexed Tree) Graph (both directed and undirected) Disjoint Set Bloom Filter https://github.com/trekhleb/javascript-algorithms

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Objects
If this language support object-orientation, provide an example of how you would write a simple object with a default constructor and then how you would instantiate it.

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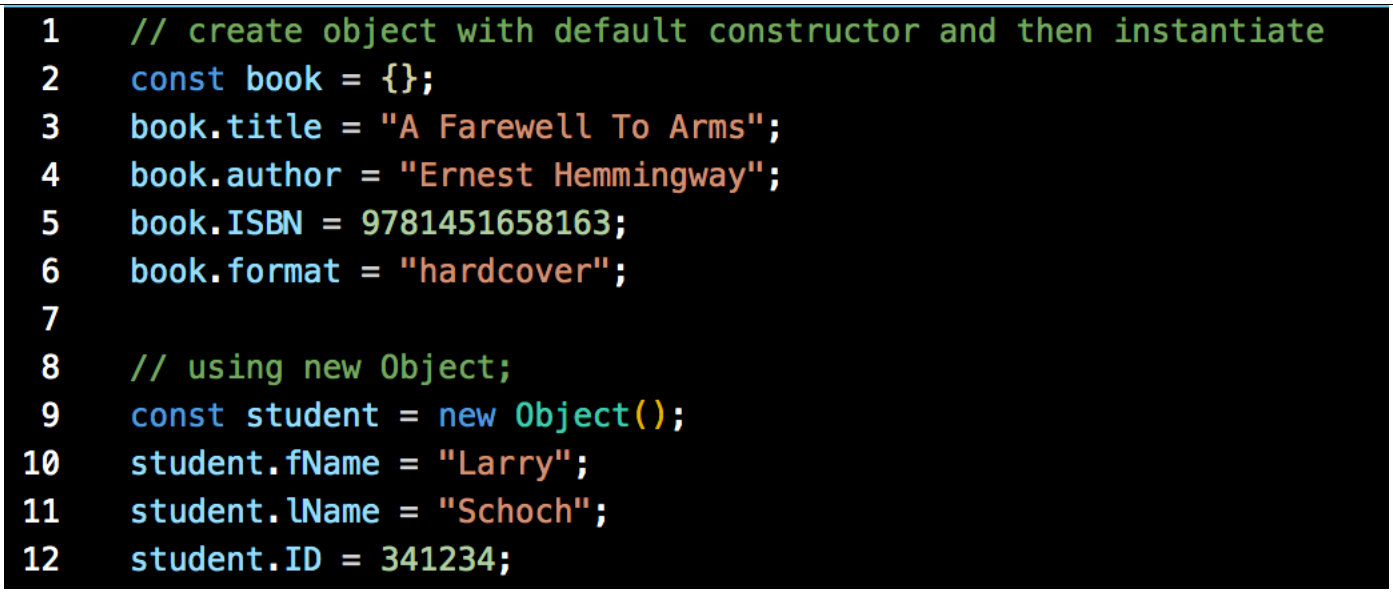

```
// create object with default constructor and then instantiate
const book = {};
book.title = "A Farewell To Arms";
book.author = "Ernest Hemmingway";
book.ISBN = 9781451658163;
book.format = "hardcover";

// using new Object;
const student = new Object();
student.fName = "Larry";
student.lName = "Schoch";
student.ID = 341234;
```

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Runtime Environment
What runtime environment does this language compile to? For example, Java compiles to the Java Virtual Machine.
Do other languages also compile to this runtime?

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JavaScript is an interpreted programming language which must be translated into machine code at runtime by a JavaScript engine. Every modern browser comes with a copy of the JavaScript engine so that Java code runs in the browser's runtime environment. Many languages can be run in modern browsers. Some browser specific languages can be run by the browser directly (e.g., XSLT which is found in several browsers) and many languages can be compiled to JavaScript. Still others are able to run via browser plugins. For back end applications, JavaScript code runs in the Node runtime environment.

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Libraries/Frameworks *What are the popular libraries or frameworks used by programmers for this language? List at least three (3) and describe what they are used for..*	1. Angular: one of the most powerful, efficient, and open-source JavaScript frameworks is Angular. Google operates this framework and is implemented to use for developing a Single Page Application (SPA). It extends the HTML into the application and interprets the attributes to perform data binding. 2. React: created by Facebook, the React framework has earned popularity within a short period. It is used to develop and operate the dynamic User Interface of the web pages with high incoming traffic. It makes the use of a virtual DOM, and hence, the integration of the same with any application is more straightforward. 3. Vue: Though developed in the year 2016, this JavaScript framework has already made its way into the market and has proven its worth by offering various features. Its dual integration mode is one of the most attractive features for creating high-end SPA or Single Page Application. It is a much reliable platform for developing cross-platform. https://hackr.io/blog/best-javascript-frameworks
Domains *What industries or domains use this programming language? Provide specific examples of companies that use this language and what they use it for*_**. E.g. Company X uses C# for its line of business applications.**_	Javascript is used by programmers across the world to create dynamic and interactive web content. It is so popular that it's the most used programming language in the world, used as a client-side programming language by 97.0% of all websites. Using NodeJS, it is possible to use JavaScript on the server side as well. Take for example Walmart. Walmart is one of the largest retailers in the world and because of its vast online business it needed a technologically advanced web application. After starting with Java, it soon found it needed something faster and lighter weight for its mobile site, so it turned to NodeJS. It then began to see Node as a valid Java replacement in other areas to the point that the Walmart.com that you see today is completely powered by Node. NodeJS was also the ideal choice for other web applications within Walmart's marketplace that require multiple users to be able to access management interfaces simultaneously. Another company that uses NodeJS is eBay. For a long time, just about everything in eBay's tech stack was based on Java. A few years ago, eBay encountered a problem that Java wasn't the right solution for. They decided to give NodeJS a shot instead. Node worked so well that eBay not only kept using it for that particular service, they began migrating their entire user facing stack to NodeJS. Now, just about everything that you interact with on eBay is powered by Node. Sure, beneath Node, Java is still dealing with their databases, but eBay still places a lot of trust in NodeJS. https://www.ironhack.com/en/web-development/10-major-companies-using-javascript - :~:text=Google develops and usually open,part of the MEAN stack.